CLAIMS

I claim:

1. A method, comprising:

combining at least carbon nanotubes and an alignment material to result in a combined material; and

causing the alignment material to align the carbon nanotubes.

2. The method of claim 1, wherein causing the alignment material to align the carbon nanotubes comprises applying a shear force to the combined material.

3. The method of claim 1, wherein causing the alignment material to align the carbon nanotubes comprises applying a field to the combined material.

4. The method of claim 3, wherein the field comprises at least one of an electric field, a magnetic field, or an electro-magnetic field.

5. The method of claim 1, wherein the resulting combined material contains greater than five percent by weight carbon nanotubes.

6. The method of claim 1, further comprising combining a matrix material with the carbon nanotubes and alignment material to result in the combined material.

7. The method of claim 6, wherein the matrix material comprises at least one of silicone polymer, epoxy polymer, olefin polymer, indium solder, or tin solder.

8. The method of claim 1, further comprising combining a filler material with the carbon nanotubes and alignment material to result in the combined material.

9. The method of claim 8, wherein the filler material is a thermally conductive material comprising at least one of aluminum oxide, boron nitride, aluminum nitride, aluminum, copper, silver, or indium solder.

10. The method of claim 1, wherein the alignment material comprises a clay material.

11. The method of claim 10, further comprising preparing the clay material, wherein preparing the clay material comprises:

dispersing the clay material in hot water having a temperature ranging from about 50 degrees Celsius to about 80 degrees Celsius;
adding cation salt to the clay dispersed in hot water;
blending the cation salt and clay;
isolating the clay; and
reducing a clay particle size to a mean size of less than about 100 microns.

12. The method of claim 11, further comprising:

combining an alpha-olefinic resin matrix material with the carbon nanotubes and the prepared clay to result in the combined material, the combined material having about thirty percent by weight carbon nanotubes, about 10 percent by weight prepared clay, and about sixty percent by weight alpha-olefinic resin matrix material;

wherein causing the prepared clay alignment material to align the carbon nanotubes comprises extruding the combined material; and

dividing the extruded combined material into pads of a selected size.

13. The method of claim 10, wherein the clay material comprises a swellable free flowing powder having a cation exchange capacity from about 0.3 to about 3.0 milliequivalents per gram of clay material.

14. The method of claim 10, wherein the clay material comprises platelet particles with a mean thickness of less than about two nanometers and a mean diameter from about 10 nanometers to about 3000 nanometers.

15. The method of claim 1, wherein the alignment material comprises a liquid crystal resin material.

16. The method of claim 15, further comprising:

layering the combined material onto a film; and

curing the combined material after causing the alignment material to align the carbon nanotubes.

17. The method of claim 16, wherein:

combining at least carbon nanotubes and an alignment material to result in a combined material comprises combining alpha-olefinic resin, carbon nanotubes, dimethylstilbene, and toluene, the combined material having about 15 percent by weight alpha-olefinic resin, about percent by weight carbon nanotubes, about 20 percent by weight dimethylstilbene, and about 50 percent by weight toluene; and

causing the alignment material to align the carbon nanotubes comprises applying a magnetic field of about 0.3 Tesla to the layered combined material.

18. A device, comprising:

a heat source;

a heat receiver to receive heat from the heat source; and

a nanocomposite thermal interface material to transfer heat from the heat source to the heat receiver, the nanocomposite thermal interface material comprising:

aligned carbon nanotubes; and

an alignment material including alignable structures for aligning the carbon nanotubes when the structures are aligned.

19. The device of claim 18, wherein the alignment material comprises a clay, the alignable structures comprise platelets, tactoids, and aggregates of tactoids, and the nanocomposite thermal interface material further comprises a polymer matrix material.

20. The device of claim 18, wherein the alignment material comprises a liquid crystal resin.

21. The device of claim 18, wherein the heat source comprises a microprocessor die and the heat receiver comprises an integrated heat sink.

22. The device of claim 21, further comprising:

a heat remover; and

a second nanocomposite thermal interface material to transfer heat from the heat integrated heat sink to the heat remover, the second nanocomposite thermal interface material comprising:

aligned carbon nanotubes; and

an alignment material including alignable structures to align the carbon nanotubes when the structures are aligned.

23. The device of claim 18, wherein the heat source comprises an integrated heat sink and the heat receiver is a heat remover.

24. The device of claim 23, wherein the heat remover comprises at least one of a heat sink, a vapor chamber, or a heat pipe.

25. The device of claim 18, wherein the heat source comprises a microprocessor die and the heat receiver comprises a heat remover.

26. The device of claim 25, wherein the heat remover comprises at least one of a heat sink, a vapor chamber, or a heat pipe.

27. The device of claim 18, wherein the heat source comprises an integrated circuit.

28. A thermal interface material, comprising:

aligned carbon nanotubes; and

an alignment material including alignable structures to align the carbon nanotubes when the structures are aligned.

29. The thermal interface material of claim 28, wherein the nanocomposite thermal interface material contains greater than five percent by weight of carbon nanotubes.

30. The thermal interface material of claim 29, wherein the nanocomposite thermal interface material contains up to about twenty-five percent by weight of carbon nanotubes.

31. The thermal interface material of claim 28, wherein the carbon nanotubes have a mean length of greater than about 10 nm.

32. The thermal interface material of claim 28, wherein the carbon nanotubes have a mean length of greater than about 100 nm.

33. The thermal interface material of claim 28, wherein the alignment material comprises a clay material comprising alignable platelet structures and the thermal interface material further comprises a matrix material.

34. The thermal interface material of claim 33, wherein the clay material comprises less than twenty-five percent by weight of the thermal interface material.

35. The thermal interface material of claim 34, wherein the clay material comprises less than five percent by weight of the nanocomposite thermal interface material.

36. The thermal interface material of claim 28, wherein the alignment material comprises a liquid crystal resin material.